

Remarks

Claims 1, 7, 46, 47 and 48 have been amended. Claim 51 has been added.

The Examiner has rejected applicant's claims 1-11, 13-21 and 46-48 under 35 U.S.C. § 101 as being directed to non-statutory subject matter.

In order to overcome this rejection, applicant has amended claim 1 as set forth above. More particularly, claim 1 has been amended to change the preamble to "A method of determining and outputting a probe candidate that is utilized for designing a base sequence to be used as a probe which is hybridized with a nucleic acid fragment to perform analysis." Further, the "determination step" of claim 1 has been amended to recite "a determination step of determining a partial base sequence as a probe candidate that is utilized for designing a base sequence to be used as a probe which is hybridized with a nucleic acid fragment to perform analysis on the basis of the evaluation result in the evaluation step." Still further, claim 1 has been amended to include the step of "outputting the probe candidate."

It is submitted that claim 1, as now presented, is directed to statutory subject matter. Namely, the method provides a concrete and tangible result in that a probe candidate is output "that is utilized for designing a base sequence to be used as a probe which is hybridized with a nucleic acid fragment to perform analysis . . ." Accordingly, applicant submits that applicant's claims 1-11, 13-21 and 46-48, as amended, recite statutory subject matter and thus satisfy the requirements of 35 U.S.C. § 101.

The Examiner has also rejected applicant's claims 1-11, 13-21 and 46 under 35 U.S.C. § 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

To overcome this rejection, claim 1 has been amended as previously discussed. Claim 7 has also been amended to recite that “the evaluation step comprises introducing an evaluation function which multiplies a change in the entropy between nodes by a weight which reduces as a distance from the center of a partial base sequence to said nodes increases.” Moreover, claim 46 has been rewritten in independent form and now includes elements appropriate for an apparatus claim.

With regard to claim 1, it is submitted that this claim, as now presented, recites a preamble that is appropriate for the method steps that are presented in the claim. Namely, that portion of the preamble questioned by the examiner is now presented within the determination step so that the probe candidate with the specified characteristics (such as those mentioned in the preamble) is determined.

With regard to claim 7, this claim has been amended to clarify the claimed invention. In particular, the evaluation function “multiplies a change in the entropy between nodes by a weight which reduces as a distance from the center of a partial base sequence to said nodes increases.” Support for the amendment to claim 7 is set forth in the specification from page 19, line 25 to page 20, line 6. The formula of the “Evaluation score” on page 20, lines 4-6 clearly provides support for the amended language of claim 7. Moreover, recitation of “the desired node increases” has been removed from claim 7, for which the Examiner asserted that support thereof was lacking in claims 1 and 6.

With regard to claim 46, this claim has been rewritten in independent form and includes various elements including “generation means,” “extraction means,” etc. that correspond to the process elements recited in claim 1.

Accordingly, applicant submits that applicant's claims 1-11, 13-21 and 46, as amended, are sufficiently definite so as to satisfy the requirements of 35 U.S.C. § 112, second paragraph. It is therefore requested that the rejection of claims 1-11, 13-21 and 46-48 under 35 U.S.C. § 101 and 35 U.S.C. § 112, second paragraph, be withdrawn.

The Examiner has rejected applicant's claims 1-3, 14, 15, 18-21 and 46 under 35 U.S.C. § 102(b) as being anticipated by Shannon, et al. (U.S. 6,251,588). The Examiner also has rejected claims 47 and 48 under 35 U.S.C. § 102(b) as being anticipated by Boebert, et al. (U.S. 4,621,321). With respect to applicant's claims, these rejections are respectfully traversed.

Claim 1, as amended, recites a generation step of generating a hierarchized tree in which a plurality of partial base sequences obtained on the basis of a plurality of target base sequences are arranged on nodes, said target base sequences including a base sequence to be examined, an extraction step of extracting a partial base sequence indicated by nodes present on a path from one of the nodes to a root node on the tree, the partial base sequence being a portion of the base sequence to be examined, an evaluation step of calculating specificity of the extracted partial base sequence among the plurality of target sequences, evaluating suitability as a probe of the extracted base sequence based on the calculated specificity and obtaining an evaluation result thereof, a determination step of determining a partial base sequence as a probe candidate that is utilized for designing a base sequence to be used as a probe which is hybridized with a nucleic acid fragment to perform analysis on the basis of the evaluation result in the evaluation step, and an output step of outputting the probe candidate. Applicant's independent claim 46 recites a corresponding apparatus.

It is submitted that the constructions recited in applicant's claims 1 and 46 are neither taught nor suggested by the cited art of record. Shannon discloses calculating hybridization characteristics between a partial base sequence and a target base sequence and then listing them such as shown in columns 30-34 of that patent. However, Shannon neither discloses nor suggests generating a hierarchized tree and, particularly, neither discloses nor suggests generating such a tree structure "in which a plurality of partial base sequences obtained on the basis of a plurality of target base sequences are arranged on nodes." In the office action on page 7, the Examiner sets forth that a target sequence corresponds to a root node and that each partial sequence corresponds to one node. However, each of the nodes (partial sequences) does not have a child node and the structure illustrated by the Examiner on page 7 of the office action does not have a hierarchical structure. In particular, the structure provided by the examiner and as being taught in Shannon constitutes a table structure, which is quite different than the hierarchical structure set forth in the claims and described in detail in the specification of the present application.

Moreover, Shannon discloses that the node is the start position of each partial sequence as discussed by the Examiner (Office Action, page 7, lines 2-3), but Shannon does not disclose, nor does it suggest, that plural partial sequences be assigned to one node of the hierarchical tree.

As set forth in the claims, and clearly described in the specification, partial base sequences are quickly and accurately evaluated by generating a hierarchical tree in which a plurality of partial base sequences obtained on the basis of a plurality of target base sequences are arranged on nodes. Shannon does not include these features.

Claims 47 and 48 have been amended to clarify the claimed invention. In particular, claim 47 has been amended to recite a program adapted to control a computer to perform the method of determining a probe candidate according to claim 1, and claim 48 has been amended to recite a storage medium for storing a program adapted to control a computer to perform the method of determining a probe candidate according to claim 1. Thus, both claims 47 and 48 include a program designed to control a computer to carry out specified steps. In light of the foregoing, it is clear that Boebert, et al. does not disclose the features recited in claims 47 and 48.

Accordingly, applicant's amended independent claim 1 and its dependent claims are not anticipated by Shannon, et al., and claims 47 and 48 are not anticipated by Boebert, et al. It is therefore requested that the rejection of the claims under 35 U.S.C. § 102(b) be withdrawn.

New claim 51 is presented. Claim 51 recites a method of designing a probe using the probe candidate obtained by performing the method of claim 1.

In view of the above, it is submitted that applicant's claims, as amended, recite statutory subject matter, are sufficiently definite, and patentably distinguish over the cited art of record. Accordingly, reconsideration and allowance of the claims are respectfully requested.

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Respectfully submitted,



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